

# (12) UK Patent Application (19) GB (11) 2 003 333 A

(21) Application No: 7833226

(22) Date of filing:

14 AUG 1978

(23) Claims filed:

14 AUG 1978

(30) Priority data:

(31) 827910

(32) 26 AUG 1977

(33) UNITED STATES OF AMERICA (US)

(43) Application published: 7 MAR 1979

(51) INT. CL.<sup>2</sup>: H01R 13/00

(52) Domestic classification:

H2E 10B 18 22B 3A12

3A15 3A1 3A2 3A6C 3A7

3C6C 3D10 3D2 3E9

G2J GEA

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(58) Field of search:

F2B

H2E

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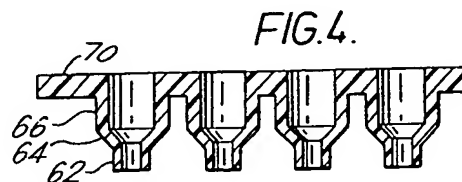
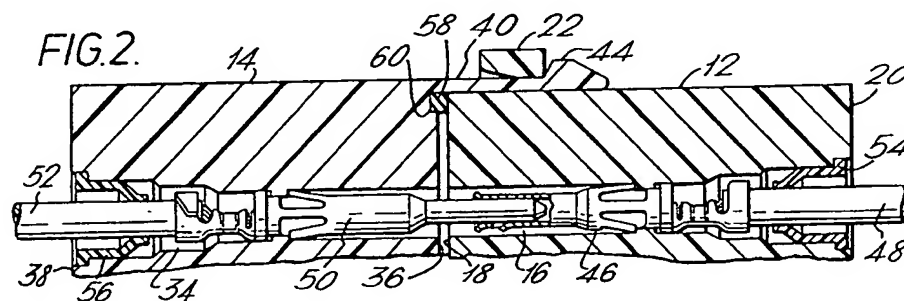
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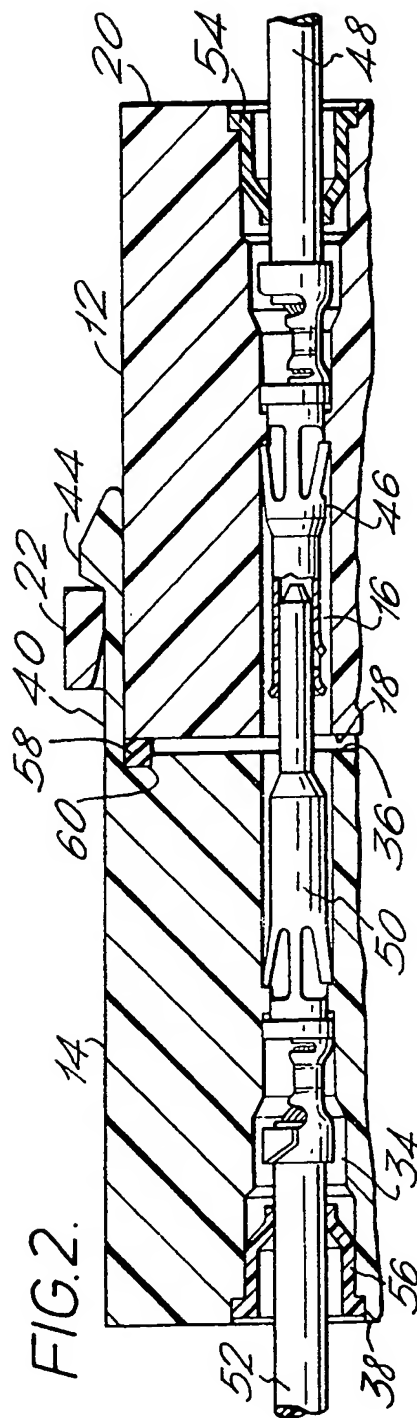
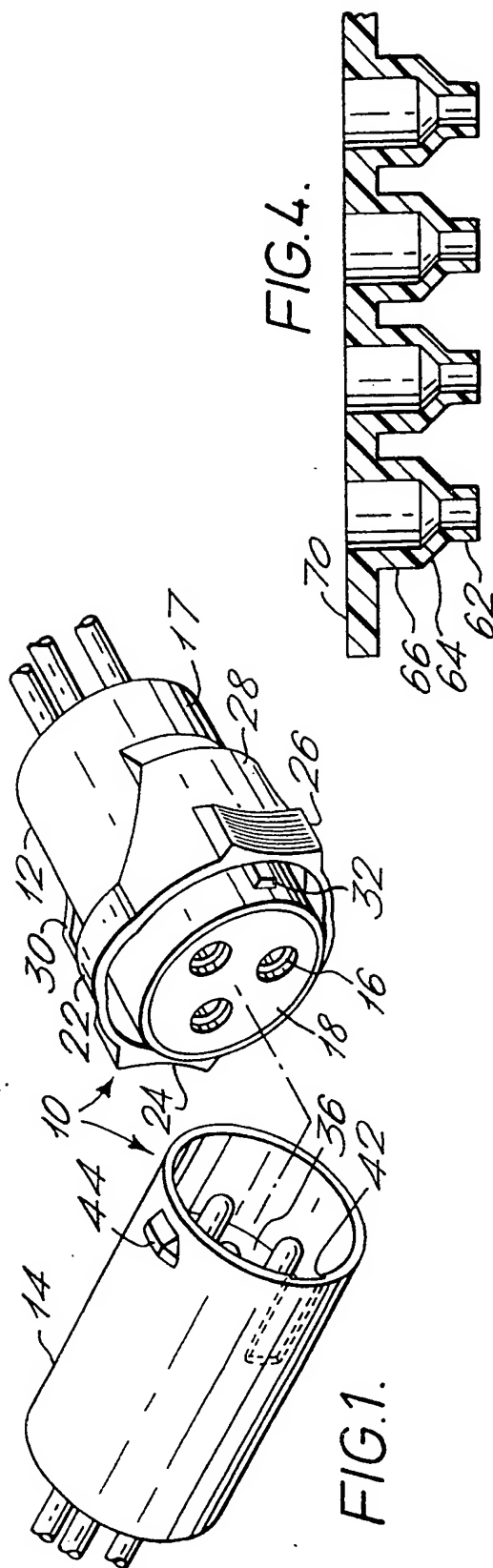
## (54) SEALED CONNECTORS

(57) A resilient sealing boot 54, 56 has a first part 66 in sealing engagement with a wall of a passageway 16, 34 in a connector and a second part 62 in sealing engagement with a lead 48 extending from a terminal mounted in the passageway, the two parts 66, 62 being joined by a third part 64 permitting flexure of the first and second parts independently of each other. The first and second parts 66, 62 may be cylindrical and the third part 64 frusto-conical. A series of sealing boots may be moulded in a carrier strip 70 and punched out of the strip 70 and inserted directly into the connector passageway.

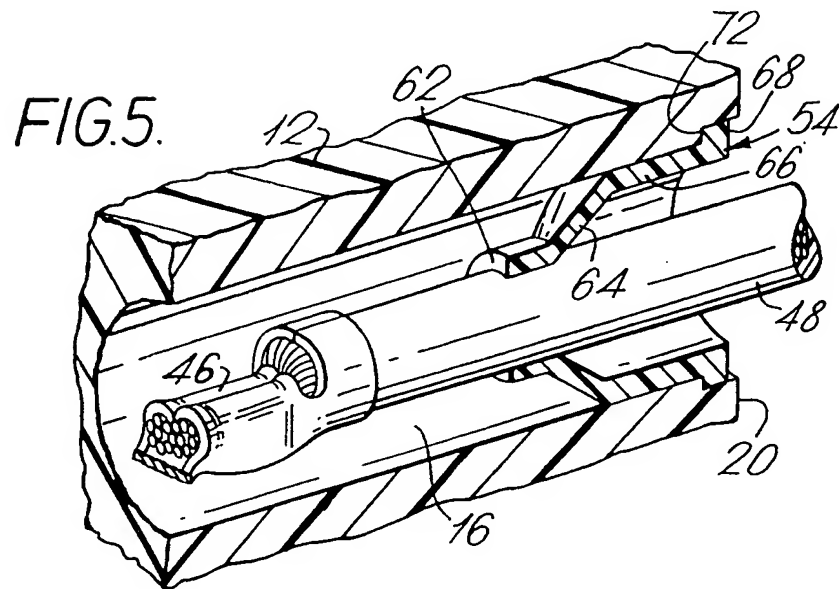
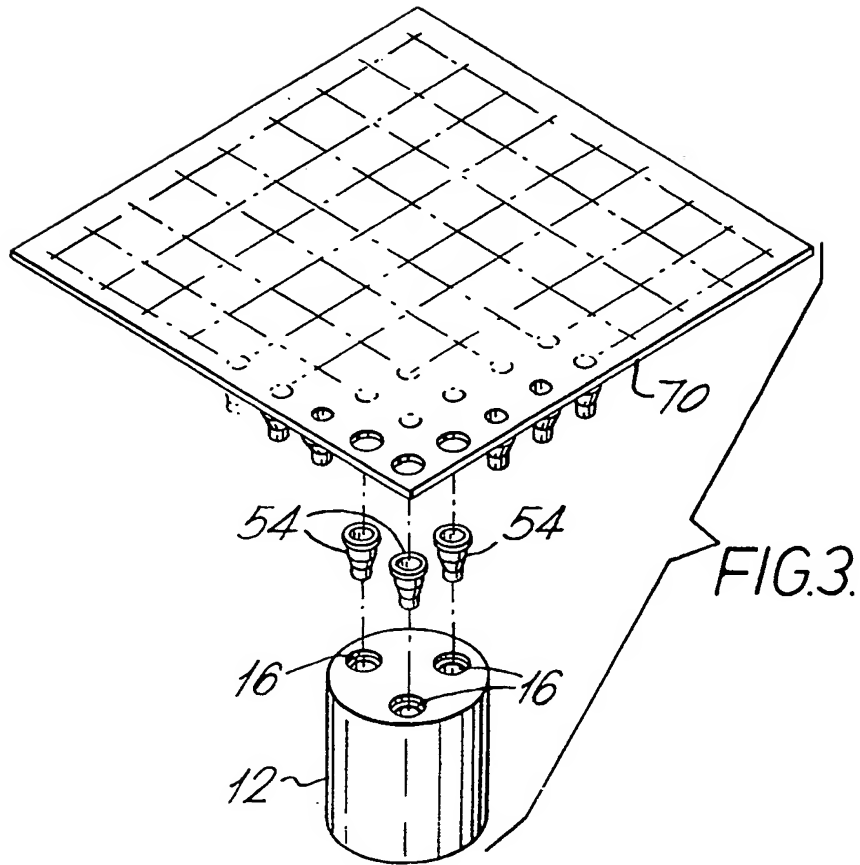


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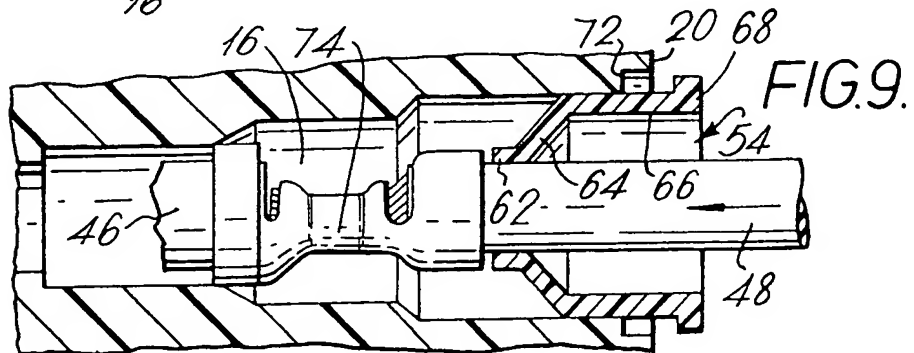
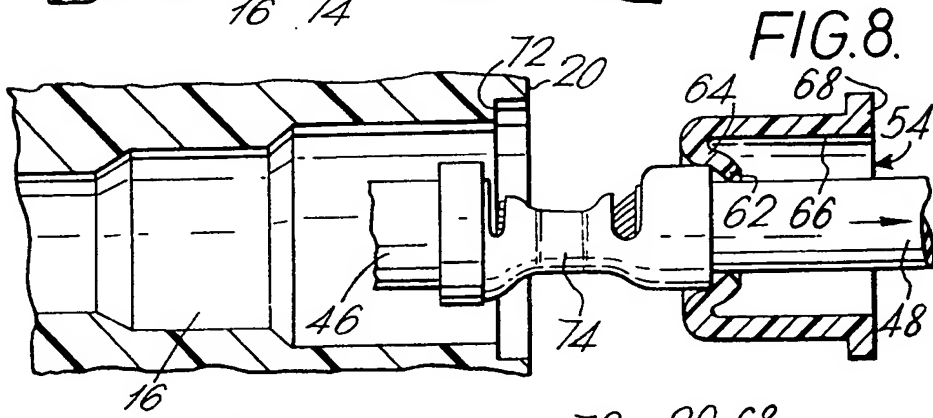
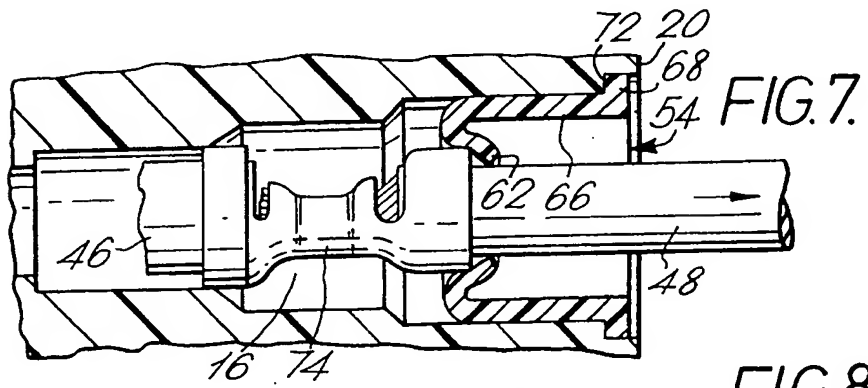
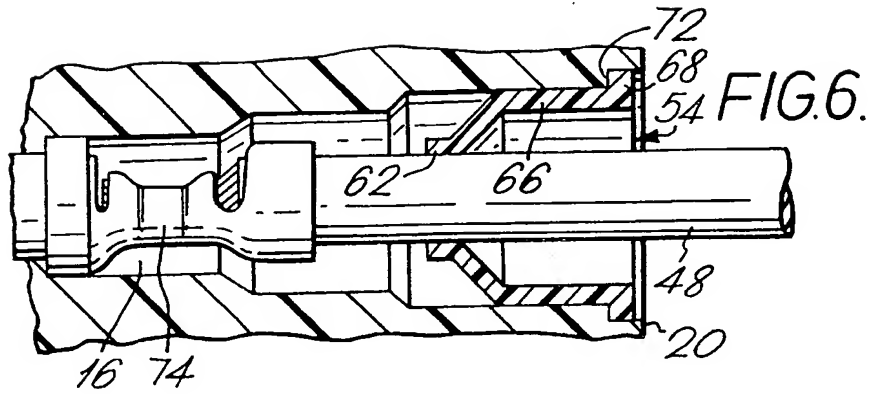
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## SPECIFICATION

## IMPROVEMENTS RELATING TO SEALED CONNECTORS

The invention relates to sealed connector members and to resilient sealing boots for use in the connector members. The invention also includes a method of making the connector members using such sealing boots.

According to the invention, a connector member comprises a body having a front, mating face and a rear face, at least one passageway extending through the body between the front and rear face, the or each passageway receiving a terminal attached to a lead with the or each lead extending from the rear face and a resilient sealing boot mounted wholly within the or each passageway adjacent the rear face, the or each sealing boot comprising a first part received in an interference, sealing fit with a wall of the or each passageway and spaced from the or each lead, a second part receiving the lead in an interference, sealing fit and spaced from the wall of the or each passageway, and an intermediate part joining the first and second parts to permit radial flexure of the first and second parts substantially independently of one another.

According to another aspect of the invention, a resilient sealing boot for the connector member described above comprises a first part adapted to be received wholly within the connector body passageway in an interference, sealing fit with a wall of the passageway, a second part adapted to receive a lead located in the passageway in an interference, sealing fit, the first part being spaced from the second part and an intermediate part joining the first and second parts to permit radial flexure of the first and second parts substantially independently of one another.

According to a further aspect of the invention, a method of making the connector member described above comprises the steps of punching at least one sealing boot from a series of sealing boots as described above formed with a carrier strip, inserting the or each sealing boot second part first into the or each passageway adjacent the rear face of the connector member so that the or each first part is a sealing, interference fit wholly within the or each passageway and inserting one or more terminals attached to one or more leads into the or each passageway adjacent the rear face and through the or each sealing boot so that the or each second part is a sealing, interference fit with the or each lead.

A specific example of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of plug and receptacle connector members according to the invention;

Figure 2 is a longitudinal cross-sectional view of a connector assembly comprising the connector members of claim 1 mated together;

Figure 3 is a diagrammatic perspective view

illustrating a method of making a connector member according to the invention;

Figure 4 is a cross-sectional view of a strip of sealing boots according to the invention;

Figure 5 is a fragmentary perspective view of one of the connector members partly in cross-section;

Figure 6 is a fragmentary longitudinal cross-sectional view of one of the connector members; and,

Figures 7 to 9 are views similar to Figure 6 showing the disposition of the connector member parts during removal and subsequent insertion of a terminated lead.

The connector assembly 10 includes a plug member 12 and a receptacle member 14 each having a body moulded in one piece of plastics material. The plug and receptacle members are each formed with a plurality of terminal-receiving through-passageways 16 and 34 respectively extending between mating faces 18 and 36 respectively and rear faces 20 and 38 respectively. An elliptical coupling ring 22, having diametrically opposite finger grips 24 and 26 is integrally joined to the plug member 12 by arms 28 and 30. A rigid polarizing projection 32 is provided on the body of the plug member adjacent the mating face. An integral, forwardly extending annular hood 40 surrounds mating face 36. A keyway 42 is formed within hood 40 receiving the polarizing projection 32. The hood 40 is also provided with a radially outwardly projecting detent 44 for engagement with the coupling ring 22. Socket and pin terminals 46 and 50 respectively, of known type, crimped to leads 48 and 52 respectively are mounted in respective through-passageways of the plug and receptacle members by inserting the terminals through respective sealing boots 54 and 56 mounted in the respective through-passageways adjacent the rear faces. A sealing O-ring 58 is provided in a recess 60 formed around the periphery of the mating face 36 to engage mating face 18 when the members 12 and 14 are mated. A seal could also be provided on individual terminals.

Each sealing boot 54, 56 is moulded in one piece of elastomeric material and comprises a first cylindrical part 66 joined to a second cylindrical part 62 of smaller diameter by an intermediate, frusto-conical part 64, a radially outwardly directed flange 68 being provided at the free end of the second part 64. The second part 62 is of a size to receive a lead 48 in an interference, sealing fit and the first part 66 is of a size to be received in an interference, sealing fit with the inner wall of the through-passageways 16 and 34. The intermediate part permits deformation of the first and second parts independently of each other and the inner taper guides a terminal and lead inserted into the first part through the second part.

The sealing boots 54, 56 are preferably integrally moulded with a carrier (Figures 3 and 4) using conventional moulding techniques, such as injection, compression or transfer moulding, from elastomeric material, with the individual sealing

boots 54 located so that they can be punched from the sheet 70 and inserted simultaneously into respective through-passageways 16 of the plug member 12, as shown in Figure 3. The sealing boots are preferably punched from the sheet 70 into a holding member (not shown), located with respect to a connector housing, and inserted simultaneously into the respective through-passageways. However, the punching and inserting may be achieved in a single operation with the proper selection of sealing boot and housing member materials, the wall of the through-passageways functioning as a severing die.

- 15 When the sealing boot 54 is fully seated in through-passageway 16, the flange 68 engages an annular shoulder 72 adjacent the rear face 20 and is slightly recessed below rear surface 20. Withdrawing a terminal 46 from the through-passageway initially causes a wiping action between the first cylindrical portion 62 and lead 48. When the crimp barrel portion 74 of contact 46 engages the sealing boot 54, it causes the second part 62 to be involuted as shown in Figure 7. The wiping action of the previously unexposed or uncontaminated portion of the lead 48 as it slides through the sealing boot 54 assures that any debris accumulated within portion 66 of the sealing boot 54 will be removed with the boot and terminal and not be allowed to enter the connector member. When the boot 54 has been fully involuted sufficient radial pressure is exerted on the lead to overcome the frictional engagement between the first cylindrical portion 66 and the wall of the through-passageway 16 causing the sealing boot 54 to be withdrawn together with the terminal 46. The terminal 46 can then be replaced and/or repaired as necessary and re-inserted, as shown in Figure 9, until the sealing boot 54 once again is fully seated in the through-passageway, as shown in Figure 6. Proper seating of the boot in the through-passageway gives a tactile indication to an operator holding the wire when the second part 62 returns to its former shape shown in Figures 5 and 6.

The invention is also applicable to the field of fibre optics for providing an environmentally sealed fibre optic connector including fibre optic terminals attached to optical fibre leads.

- 50 It should be noted that the independently movable first and second sealing parts of the sealing boot enables the individual boots to be located without dislodgement in the through-passageways during insertion of a terminal through the boot into the through-passageway. The shape of the sealing boot also enables involution and a high pull out force on the lead dislodging the boot from the through-passageway during withdrawal of the terminal.

## 60 CLAIMS

1. A connector member comprising a body having a front, mating face and a rear face, at least one passageway extending through the body

- 65 between the front and rear face, the or each passageway receiving a terminal attached to a lead with the or each lead extending from the rear face and a resilient sealing boot mounted wholly within the or each passageway adjacent the rear face, the or each sealing boot comprising a first part received in an interference, sealing fit with a wall of the or each passageway and spaced from the or each lead, a second part receiving the lead in an interference, sealing fit and spaced from the wall of the or each passageway, and an intermediate part joining the first and second parts to permit radial flexure of the first and second parts substantially independently of one another.

2. A connector member according to claim 1 in which the second part is located forwardly of the first part and the intermediate part is of frusto-conical shape.

3. A resilient sealing boot for a connector member according to claim 1 comprising a first part adapted to be received wholly within the connector body passageway in an interference, sealing fit with a wall of the passageway, a second part adapted to receive a lead located in the passageway in an interference, sealing fit, the first part being spaced from the second part and an intermediate part joining the first and second parts to permit radial flexure of the first and second parts substantially independently of one another.

4. A resilient sealing boot according to claim 3 in which the first and second parts are of cylindrical shape and the intermediate part is of frusto-conical shape.

5. A series of sealing boots according to claim 3 or claim 4 integrally formed with a carrier strip.

6. A method of making a connector member according to claim 1 comprising the steps of punching at least one sealing boot from a series of sealing boots according to claim 3 or claim 4 formed with a carrier strip, inserting the or each sealing boot second part first into the or each passageway adjacent the rear face of the connector member so that the or each first part is a sealing, interference fit wholly within the or each passageway and inserting one or more terminals attached to one or more leads into the or each passageway adjacent the rear face and through the or each sealing boot so that the or each second part is a sealing, interference fit with the or each lead.

7. A method of making a connector member according to claim 6 in which the sealing boots are simultaneously punched out from the strip against the rear face of the connector body with the cavity wall defining a die shearing the sealing boots from the strip.

8. A connector member substantially as described with reference to the accompanying drawings.

9. A strip of resilient sealing boots substantially as described with reference to Figures 3 and 4 of the accompanying drawings.

10. A method of making a connector member  
according to claim 8 and substantially as

described with reference to the accompanying  
drawings.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1979  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from  
which copies may be obtained.